

SECTION 5

APU

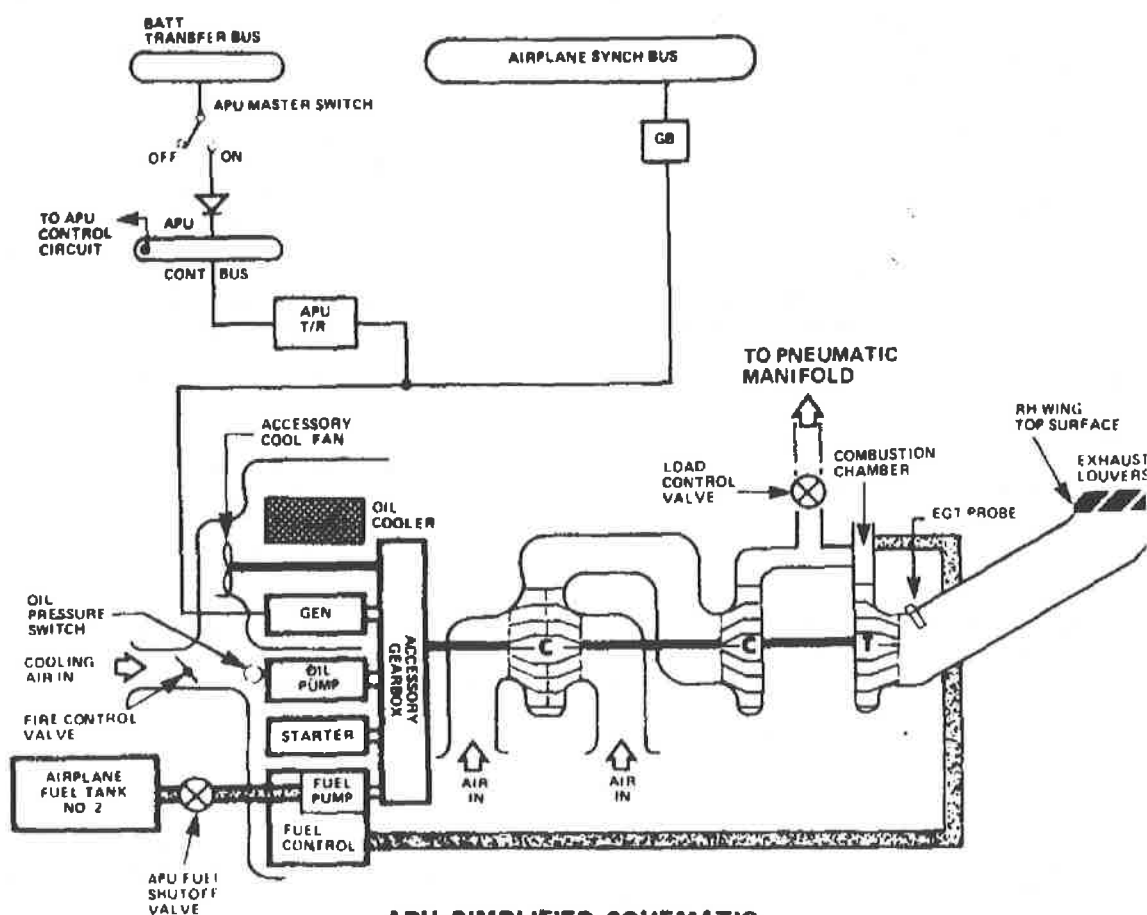
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DESCRIPTION**GENERAL**

The Auxiliary Power Unit (APU) is a gas turbine engine installed across the keel beam in the forward end of the main wheel well. The exhaust is vented through a louvered opening in the upper inboard surface of the right wing. The APU may be used, on the ground only, to provide electrical power and compressed air to operate the various aircraft systems. Fuel consumption is approximately 270 pounds per hour.

The APU uses fuel from the #2 fuel tank, and the aircraft battery powers the starter. With the battery switch ON and the APU Master Switch in the START position, a series of automatically controlled events is initiated to start the APU. Ignition, starter cutout, acceleration and ignition de-energization are automatically controlled for optimum performance. After governed speed is reached, the APU may be used to provide pneumatic and electrical power as desired. Under high pneumatic loads, such as during engine start, the amount of available bleed air will be controlled to maintain a desired exhaust gas temperature.

**APU SIMPLIFIED SCHEMATIC****QUICK REFERENCE DATA**

DESCRIPTION (Cont.)**GAS TURBINE**

The gas turbine engine is composed of a two-stage centrifugal compressor coupled to a single-stage turbine. The accessory drive section, coupled to the turbine shaft, provides power for driving engine accessories and the generator. Ambient air is compressed by the primary and secondary compressors and then directed to the pneumatic system through a load control and shutoff valve. Air that is not bled off is directed to the combustion chamber, mixed with fuel, and burned to drive the turbine.

IGNITION AND STARTING SYSTEM

After start is initiated, the ignition and starting system is automatically controlled to sequence the energizing and de-energizing of the starter motor and the ignition unit. With a rise of oil pressure to a predetermined value, an oil pressure switch closes to energize the ignition unit and the fuel solenoid valve.

When the APU engine speed accelerates to approximately 35% of governed speed, the starter relay is de-energized, and this deenergizes the starter motor circuit and terminates starter operation. The engine continues to accelerate until it has reached 95% of governed speed, at which time ignition is terminated.

FUEL SYSTEM

Fuel is supplied to the APU from the #2 fuel tank through a fuel shutoff valve. Fuel flow is regulated to maintain a constant turbine speed under varying load conditions and to maintain turbine temperatures within established limits. The entire system is controlled automatically with the exception of the fuel shutoff valve. When the APU master switch is placed in the ON position the shutoff valve opens and fuel is supplied to the fuel pump and fuel control unit if the turbine is rotating. Fuel passes from the fuel pump and control unit through a fuel solenoid valve to a fuel atomizer for injection into the turbine combustion chamber. If the turbine overspeeds, a 110% switch will deenergize the fuel solenoid valve, allowing it to close. This shuts off fuel to the combustion chamber and the unit shuts down.

COOLING AIR SYSTEM

Air is drawn from the left wheel well through a cooling well inlet, sound suppressor and fire control valve, to cool the shroud, engine accessories and lower exhaust duct. When the APU is shut down, the fire control valve closes to prevent the fire extinguishing agent from escaping through the cooling air inlet if the fire extinguishing system is activated.

ELECTRICAL POWER SYSTEM

Electrical power is supplied by a 40KVA generator geared directly to the APU accessory drive. The APU generator cannot be operated in parallel with the engine-driven generators or an external power unit. Protective circuits are similar to those of the engine-driven generators.

BLEED AIR SYSTEM

Air is bled from the compressor section, for air conditioning and engine starting, through a Bleed Air and Load Control Valve. The Control Valve limits bleed airflow to maintain a desired maximum EGT. As electrical loads increase, bleed airflow decreases. Maximum bleed airflow is available with minimum electrical loads.

● 100/QC

Compressed air for engine start and air conditioning is supplied through the Wing Thermal Anti-Ice ducting. APU isolation valves are used to shut off the air to each wing, preventing loss of air overboard. Both APU isolation valves must be closed before the APU bleed air valve will open.

● 225/225A

Separate ducting is provided, eliminating the requirement for isolation valves.

AUTOMATIC SEQUENCING CONTROLS

To start the APU:

- The airplane must be on the ground (ground safety relay in the ground position).

NOTE: While the APU cannot be started in flight and is restricted to ground use only (Limitations), it will continue to run if inadvertently not shut down prior to takeoff. This could result in an APU Fire Warning in flight.

- The battery switch must be ON.
- The APU fire switch and the remote APU fire switch must be closed.
- The remote APU stop switch must be in the normal position.
- The APU fire warning test-reset switch of the fire detection system must have been moved to the momentary RESET position (if this system has been tested), and the fire detection elements must have cooled below the fire alarm temperature setting.

When the APU Master Switch is placed to ON, the fuel shutoff valve opens. The "APU" light (S/O's DOOR annunciator panel) comes on whenever the valve is not fully closed provided that AC power is on the aircraft.

DESCRIPTION (Cont.)

Momentarily placing the APU master switch to the START position will initiate the following automatic sequence:

- The APU starter motor will be energized, as evidenced by the illuminated APU CRANK light on the Electrical Fault panel.
- As oil pressure rises with increased speed of APU rotation, a low oil pressure switch will complete the circuit to the ignition, the fuel solenoid valve will be energized to open, and fuel will be injected into the APU combustion chamber and ignited.
- When the APU turbine reaches approximately 35% of governed speed, the starter motor will cut out and the APU CRANK light will go out.
- Exhaust gas temperature and acceleration rate are monitored and controlled automatically.
- When the speed reaches 95% of governed speed, ignition ceases.
- If the unit should overspeed to or exceed 110% of governed speed, the 110% overspeed switch will shut down the APU.

Turning the APU Master sw OFF simulates an overspeed condition. The fuel solenoid and fuel shutoff valves close and the APU shuts down. On unmodified airplanes, the fuel solenoid closes, the APU shuts down and the fuel shutoff valve closes when oil pressure drops below a preset value. In either case, the "APU" light goes out when the fuel shutoff valve is fully closed.

Using the remote stop sw (left wheel/well), for APU shutdown closes the fuel solenoid valve (APU shuts down) but the fuel shutoff valve will stay open until APU Master sw is turned OFF.

If APU is shut down by either fire sw or the auto fire shutdown relay, the fuel shutoff valve closes immediately accompanied by other normal shutdown actions. Fire warning and extinguishing circuits are operative during shutdown if Battery sw is ON.

APU BLEED (225/225A)

When an ENGINE 2/APU BLEED switch is set to OPEN, the Engine 2 bleed valve and the respective Bleed Air Manifold Isolation valve are opened and the APU Bleed & Load Control valve is armed. With the APU operating and all engines shut off, APU bleed air is available for engine start or for A/C pack operation.

In this configuration, when either or both Pack switches are ON both Flow Control Shutoff & Pressure Override valves are closed and the APU bleed air is available to the pack(s). This isolates the pressure from the Pressure Transmitters and DUCT Pressure indication will be zero (some pressure may be displayed because of acceptable leakage thru the valves).

With both PACK switches OFF, the APU bleed air pressure will open the Flow Control Shutoff & Pressure Override valves and the pressure will be available for engine start. In this configuration, the Pressure Transmitters sense the pressure and it will be displayed on the DUCT pressure indicators.

With the APU and an engine(s) supplying bleed air (respective BLEED AIR switches OPEN) and the engine-driven generator powering the busses, the Flow Control Supply & Pressure Override valves will not close when a PACK switch is turned ON.

FLOW MULTIPLIER (225/225A)

A flow multiplier is installed on 225/225A aircraft to increase airflow from the APU so that both air conditioning packs can be operated on the ground. The flow multiplier is a small turbine/compressor, installed in the air conditioning bleed air supply ducting just forward of the right wheel well.

A solenoid controlled, pneumatically operated shutoff valve controls the APU bleed air input into the turbine of the flow multiplier. A motor operated bypass valve is installed in a duct to bypass air around the turbine. One valve is always closed when the other is opened.

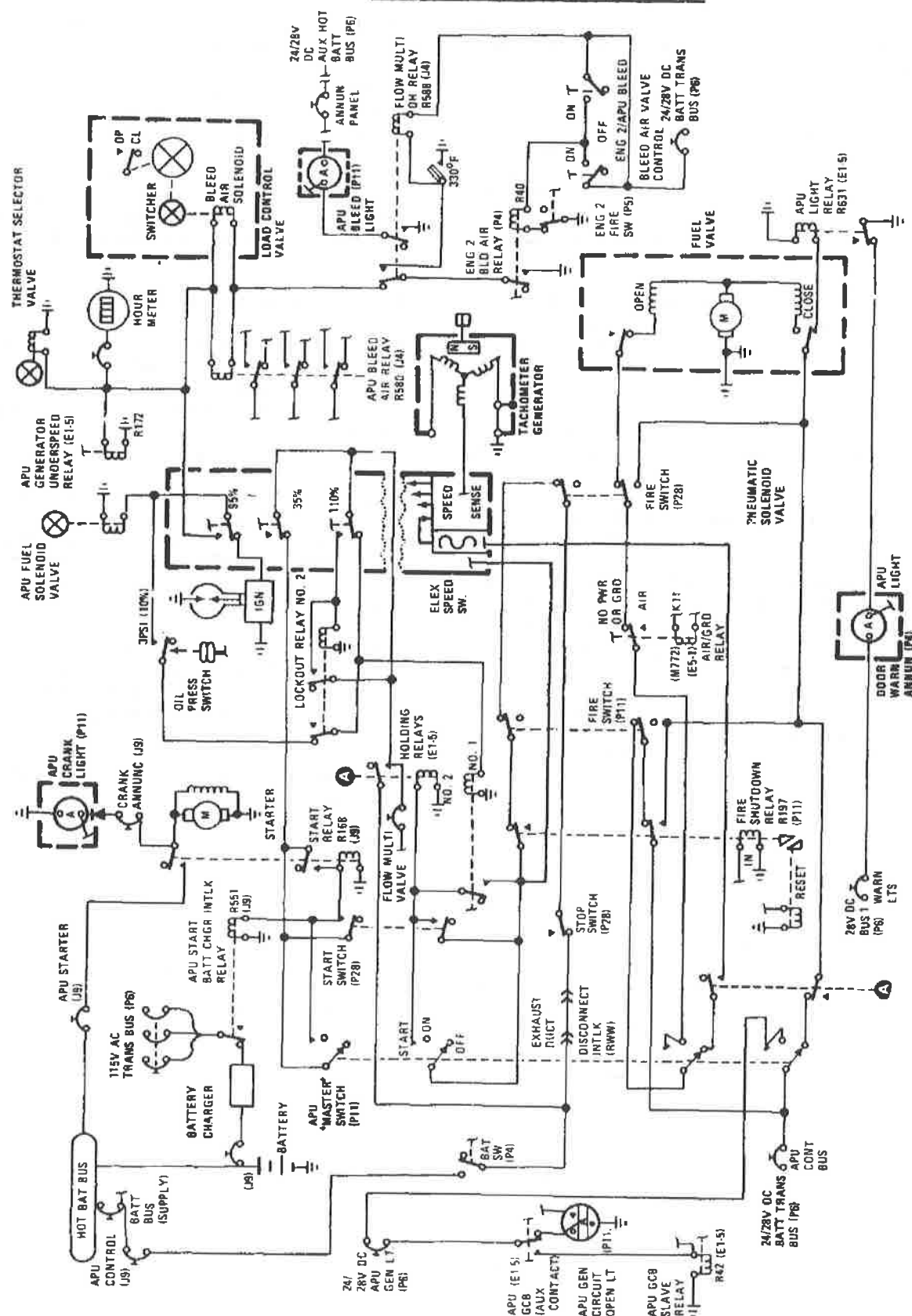
When the APU is supplying air for engine start (both packs off) or for one pack operation, the bypass valve will be open and the shutoff valve closed, allowing APU air to bypass the flow multiplier.

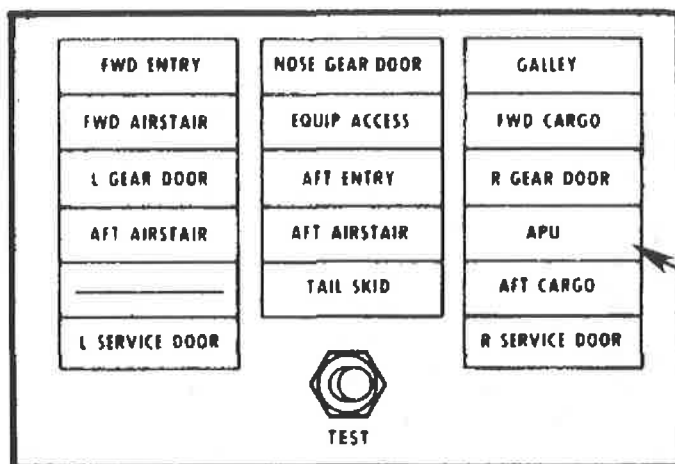
When both packs are turned on and the APU is supplying bleed air, the bypass valve will close and the shutoff valve will open. APU air drives the flow multiplier turbine and then goes on to the pneumatic manifold. The turbine drives a compressor, which draws air through an inlet in the outboard forward corner of the right hand wheel well. The compressed air is mixed with the air from the turbine, providing the necessary volume of air to drive both air conditioning packs.

An overheat switch is installed in the compressor discharge duct. If discharge air is too hot, the switch will close, causing the bleed air valve to close and an APU BLEED light on the S/O auxiliary panel to come on. To reset a flow multiplier overheat:

- Both ENGINE 2/APU BLEED switches must be positioned to CLOSE.
- Turn both air conditioning pack switches OFF.
- When APU BLEED light goes out, position both ENG 2/APU BLEED switches to OPEN.
- Restore air conditioning as desired. Selecting a slightly warmer temperature may prevent another flow multiplier overheat.

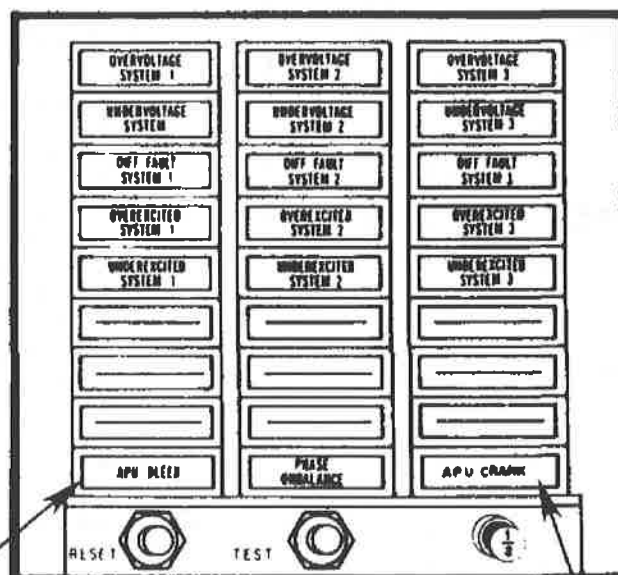
ELECTRICAL DIAGRAM (TYPICAL)



CONTROLS AND INDICATORSAPU ANNUNCIATOR LIGHTS

On S/O's Lower Panel

APU LIGHT (Amber)
- When on, indicates that the APU Fuel Shutoff Valve is not closed.

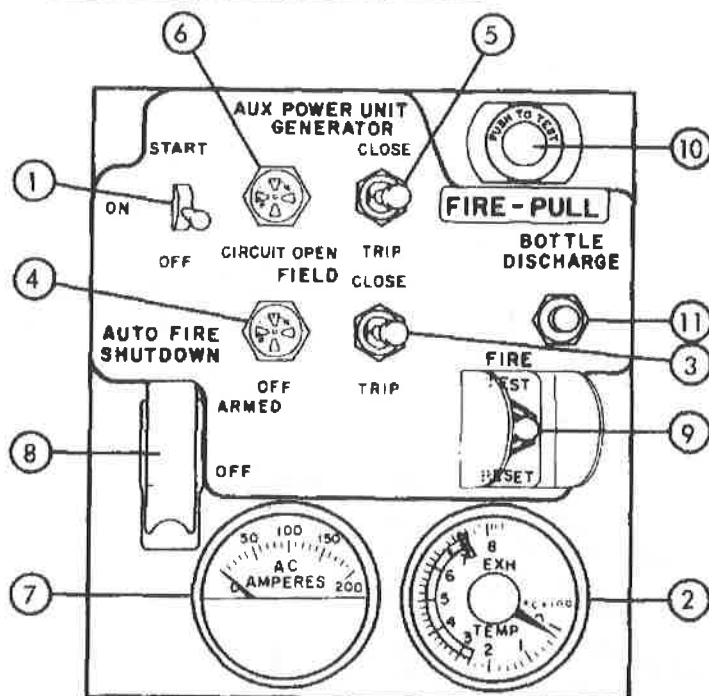


On S/O's Auxiliary Panel

BLEED AIR LIGHT (Amber)
- On 225/225A Only.
ON - Indicates an overheat condition of the flow multiplier
- APU bleed valve closes.

APU CRANK LIGHT (Amber)
- When on, indicates that the APU start sequence has started.
- Light goes out at APU starter cutoff.
- Maximum cranking time is 30 seconds.
- Pull Fire Switch if no "Light-Off".

QUICK REFERENCE DATA

CONTROLS AND INDICATORSAPU COCKPIT CONTROL PANEL

On S/O's Auxiliary Panel

① APU MASTER SWITCH

- ON** - Normal position during APU operation.
- Opens APU fuel shutoff valve.
- START** - Spring loaded from START to ON position.
- Completes starting circuits.
 - On 100/QC, arms APU isolation valves. Valves will close when Standby AC Bus is powered.
- OFF** - Fuel is shut off, and
- APU stops.
 - Generator breaker trips.
 - Bleed valve closes.
 - APU isolation valve open.

② APU EGT INDICATOR

- APU EGT maximum limit is 710°C (start).
- APU EGT limit for continuous operation is 677°C.

③ FIELD RELAY SWITCH

- CLOSE** - Allows generator to produce electrical power.
- TRIP** - Deactivates generator.

④ FIELD CIRCUIT OPEN LIGHT (Amber)

- Indicates generator field is open and generator power is not available.

⑤ GENERATOR BREAKER SWITCH

- CLOSE** - Trips the aircraft generator breakers, or external power breaker, if closed, and connects the APU generator to the aircraft tie bus.
- APU generator breaker is tripped automatically when an operating engine generator breaker switch is positioned to CLOSE.

TRIP - Opens the circuit between the APU generator and the tie bus.

⑥ GENERATOR CIRCUIT OPEN LIGHT (Amber)

- ON** - Indicates that the generator breaker is tripped.
- OFF** - Indicates that the APU generator is connected to the tie bus.

⑦ APU AMMETER

- Indicates APU electrical load.
- If the aircraft is on external power, indicates EPU electrical load.
- Max. continuous electrical load is 165 Amps.

(Continued)

QUICK REFERENCE DATA

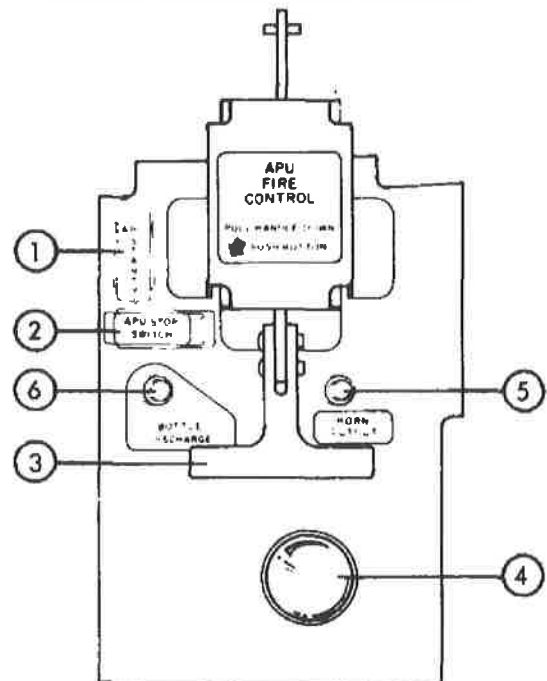
CONTROLS AND INDICATORS (Cont.)APU COCKPIT CONTROL PANEL (Continued)

- ⑧ **AUTO FIRE SHUTDOWN SWITCH**
ARMED - A fire warning or test will automatically shut down the APU.
OFF (or OVERRIDE) - Automatic shutdown feature is deactivated.
- ⑨ **FIRE TEST/RESET SWITCH**
FIRE TEST - Functional test of the fire warning system.
 - Max time: 30 sec. Up to 60 sec. when temp is 32°F or below. Wait 5 minutes between test cycles.
RESET - Used for bell cutout, and resets automatic shutdown feature.
 - Must be reset to start APU.
 - Turns Flashing Red Light in left Wheel Well steady.
- ⑩ **FIRE SWITCH AND FIRE WARNING LIGHT**
 - Red fire warning light on indicates an APU fire. Cockpit fire bell rings, ground intermittent horn sounds, and red light in left wheel well flashes.
 - Pulling out on fire switch:
 • Arms the extinguishing system.
 • Trips APU generator field relay.
 • Shuts off fuel and bleed air.

- ⑪ **BOTTLE DISCHARGE BUTTON**
 - If fire switch is pulled, depressing the button will discharge Freon into the APU shroud.

APU EXTERNAL CONTROL PANEL

- ① **APU START SWITCH**
 - May be used to start the APU when battery switch and APU start switch (cockpit control panels) are on.
 - Normally used by maintenance.
- ② **APU STOP SWITCH**
 - Shuts off fuel to the APU.
- ③ **APU FIRE SWITCH**
 - Pulling the fire switch:
 • Arms the fire extinguishing system.
 • Trips the generator field relay.
 • Shuts off fuel and bleed air.

APU EXTERNAL CONTROL PANELLEFT WHEEL WELL

- ④ **APU FIRE WARNING LIGHT**
 - Flashing red fire warning light indicates an APU fire.
 - Steady red light indicates an APU fire, but horn/bell cutout switch has been pressed.
- ⑤ **APU HORN CUTOUT SWITCH**
 - Silences the fire alarm bell (in cockpit) and APU fire warning horn.
 - Turns flashing light steady.
- ⑥ **BOTTLE DISCHARGE BUTTON**
 - When fire switch is pulled, depressing the button will discharge Freon into the APU shroud.

QUICK REFERENCE DATA

OPERATING PROCEDURES**APU START PROCEDURE**

COCKPIT SAFETY INSPECTION -Refer to page 1-1-19 of this publication. COMPLETE

DC METERS BATT

BATTERY SW ON

- NOTE: Minimum of 21 volts.

A/C METERS APU

ESS PWR APU

FIRE TEST/RESET FIRE TEST

- NOTE: APU fire warning light illuminates and fire warning bell sounds.

- CAUTION: Do not hold fire test switch in "TEST" for longer than 60 seconds. Damage to the loop could result.

FIRE TEST-RESET RESET

- Reset to silence fire warning bell and wait for fire warning light to go out. Hold switch to reset to RESET the AUTO FIRE SHUTDOWN system.

APU MASTER SWITCH ON

- NOTE: Field "OFF" light out.

- Generator "CIRCUIT OPEN" light on.

APU MASTER SWITCH START

- Hold in start until the crank light illuminates. Release switch and check DC ammeter showing full scale negative (discharge).
- Monitor EGT rise max start EGT 710°C. IF 710°C EXCEEDED SEE TROUBLE SHOOTING AND TEST
- APU crank light out within limits and DC ammeter returns to normal.

APU VOLTS & FREQ CHECK

- 115 \pm 5 volts 400 \pm 10 cps

BUS TIE LIGHTS OUT

- Press to test.

APU GENERATOR BREAKER CLOSED

- Generator "CIRCUIT OPEN" light goes out.
- APU light on S/O panel illuminates.
- Essential power failure light goes out.

QUICK REFERENCE DATA

OPERATING PROCEDURES (Cont.)OPERATING LIMITS

CONDITION	INDICATOR	RANGE	LIMIT
FUEL QUANTITY REQUIREMENT FOR STARTING AND SUSTAINED OPERATION	MAIN FUEL TANK INDICATOR NO. 2	FOR SUSTAINED OPERATION, ADD 200 POUNDS (90 KILOGRAMS) TO MINIMUM LIMIT FOR EACH HOUR OF PLANNED OPERATION	MINIMUM FOR STARTING AIRPLANE PARKED 350 POUNDS *[8][9] 150 KILOGRAMS AIRPLANE TAXIING 3500 POUNDS *[8][9] 1590 KILOGRAMS
BATTERY	DC VOLTMETER (PRIOR TO STARTING APU)	22-28 VDC WITHOUT AC POWER; 26-28 VDC WITH AC POWER	22 VDC (MIN) WITHOUT AC POWER; 26 VDC (MIN) WITH AC POWER
APU STARTING	APU CRANK LIGHT AND DC AMMETER (PEGGED FULL SCALE NEGATIVE)	STARTER DUTY CYCLE OF 1 MINUTE "ON" 4 MINUTES "OFF"	1 MINUTE PER CYCLE *[7]
STABILIZED OPERATION "NO LOAD"	EGT RPM *[3] FREQUENCY METER	NOT TO EXCEED 350°C 100.75 to 101.25% 405 to 410 Hz	350°C 101.25% 410 Hz MAX
APU BLEED AIR SW "CLOSED"	BLEED DUCT PRESSURE	0	0
APU BLEED AIR SW "OPEN"	BLEED DUCT PRESSURE	45 ± 5 PSIG *[4] AT SEA LEVEL	30 PSIG MIN
SUSTAINED OPERATION "LOADED" *[6]	EGT RPM *[3] FREQUENCY METER *[5]	590 to 620°C *[1] 99.5 to 98% 395 ± 5 Hz	663°C MAX *[2] 98% 395 Hz MIN

*(1) For extended APU service life, corrective maintenance action is required if continuous operation above 620°C is experienced.

*(2) CAUTION: IF DURING NORMAL CONTINUOUS OPERATION, EGT IS BETWEEN 663°C AND 710°C, SHUT DOWN APU IMMEDIATELY AND TAKE CORRECTIVE ACTION (REF TROUBLE SHOOTING).

IF DURING START/ACCELERATION CYCLE EGT IS ABOVE 710°C EXAMINE APU PER PROCEDURE FOLLOWING OVERTEMPERATURE DURING START (REF MAINTENANCE PRACTICES, PAR 12).

IF DURING ANY STEADY-STATE OPERATION, EGT EXCEEDS 710°C REPLACE APU (REF 49-19-0 OR 49-10-01, R/I).

*(3) When RPM indicator nd tachometer-generator test set is installed.

*(4) Subtract 1/2 PSIG for every 1000 ft elevation.

*(5) Small fluctuations (2-4 Hz) in frequency meter are acceptable.

*(6) Specified "LOADED" condition is pneumatically (2 packs) and electrically (60 amps incremental increase).

*(7) A cooling period of 30 minutes is required after 4 starter motor duty cycles.

*(8) Bladder cells only. For integral tanks use 750 pounds (340 kilograms) parked and 4800 pounds (2180 kilograms) taxiing.

*(9) EA 801-822, 880-892 plus EA airplanes incorporation SB 49-46, have an alternate fuel feed source which provides fuel whenever operating No. 2 main engine boost pump.

OPERATING PROCEDURES (Cont.)**APU NORMAL SHUTDOWN**

CAUTION: TO PREVENT DAMAGE TO THE FUEL PUMP CAUSED BY FUEL STARVATION, DO NOT STOP UNIT WITH FIRE SWITCH UNLESS AN EMERGENCY EXISTS.

AC PACK SWITCH(ES) OFF
 ● Allow the APU to run for 3 minutes under a no load condition or allow EGT to stabilize under 350°C.

APU GENERATOR BREAKER OPEN
 ● Generator "CIRCUIT OPEN" light illuminates
 ● APU light on S/O panel goes out (if there is no other a/c source)

APU MASTER SWITCH OFF
 ● APU generator field really must be closed for normal shutdown.

APU SHUTDOWN USING THE REMOTE STOP SWITCH

NOTE: Allow a 3 minute cooling period or EGT below 350°C after unloading electrically and pneumatically before shutting down the APU.

AC PACK SWITCH(ES) OFF

APU GENERATOR BREAKER OPEN

APU REMOTE STOP SWITCH STOP

NOTE: Use of the remote stop switch interrupts the control circuit only and does not close the APU fuel shutoff valve. If the APU is stopped by the remote stop switch, the following steps must be performed before the airplane can be flown.

APU MASTER SWITCH OFF
 Placing the master switch to off will close the APU fuel shutoff valve.

B-727 APU FIRE EXTINGUISHING PROCEDURE

- A. Should a fire occur in APU shroud area, the following will happen:
 - (1) APU will automatically shut itself down.
 - (2) Fire warning bell in flight compartment will ring.
 - (3) Red APU fire warning light illuminates in flight compartment fire handle.
 - (4) Flashing red light operates on APU Ground Control Panel.
 - (5) Pulsating fire horn sounds from nose wheel well area.
 - B. APU fire extinguishing operation from flight compartment.
 - (1) Pull APU fire handle.
 - (2) Depress bottle discharge switch for two seconds.
 - C. APU fire extinguishing operation from APU Ground Control Panel.
 - (1) Pull fire handle down.
 - (2) Depress bottle discharge switch for two seconds.
 - D. Notify Maintenance Supervisor of action.
-

QUICK REFERENCE DATA

OPERATING PROCEDURES (Cont.)

APU MOTORING (Ref. MM Chapter 49-00)**Equipment and Materials**

- 5-gallon container
- Fuel hose

NOTE: Fabricate fuel hose to reach into the 5-gallon container and to mate with the fitting on end of high pressure fuel line disconnected from fuel atomizer.

- 1) Open main landing gear doors and install downlocks.
- 2) Open APU control circuit breakers on circuit breaker panel P6 and APU control shelf E1-5.
- 3) Remove clamp attaching combustion chamber shroud to APU and lift shroud from unit to full length of ignition wiring. Tie or tape shroud to APU or airplane structure to prevent damaging ignition wiring.
- 4) Disconnect airplane wiring electrical connector from ignition unit.

WARNING: IF AIRPLANE WIRING IS NOT DISCONNECTED FROM IGNITION UNIT, HIGH INTENSITY CURRENT WILL BE GENERATED BY THE IGNITION UNIT, WHICH CAN BE FATAL.

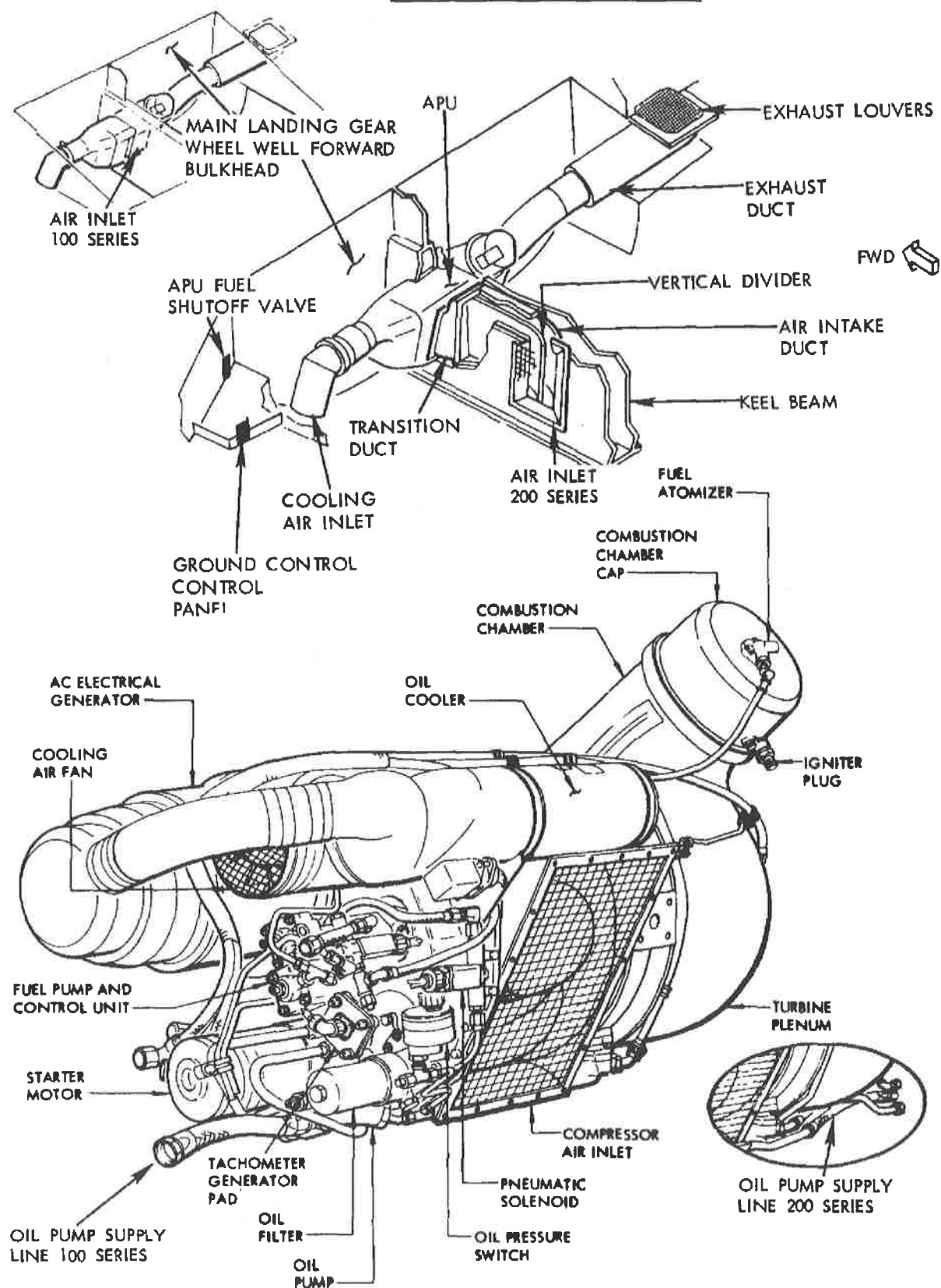
- 5) Disconnect fuel line from atomizer and place end of fuel line in 5-gallon container.
- 6) Check that APU control circuit breaker on APU control shelf E1-5 and P6 is closed.
- 7) Place battery switch to ON position.
- 8) Place APU master switch to ON position.
- 9) Motor engine by placing APU master switch or remote start switch momentarily to START position.

CAUTION: TO PREVENT DAMAGE, DO NOT EXCEED STARTER DUTY CYCLE. HIGH ENERGY ELECTRICAL STARTERS ARE EASILY OVERHEATED AND, CONSEQUENTLY, ARE EASILY DAMAGED.

- 10) Terminate motoring run by placing APU master switch to OFF position or actuating remote stop switch.
- 11) If remote stop switch was used, place APU master switch to OFF position to close fuel valve.
- 12) Connect fuel line to fuel atomizer.
- 13) Open APU control circuit breakers on circuit breaker panel P6 and APU control shelf E1-5.
- 14) Connect electrical connector to ignition unit.
- 15) Position combustion chamber shroud on APU and install clamp.
- 16) Close APU control circuit breaker on circuit breaker panel P6 and APU control shelf E1-5.
- 17) Place battery switch in OFF position.
- 18) Remove downlocks and close main landing gear doors.

COMPONENT LOCATION AND SERVICING

APU MAJOR COMPONENTS



COMPONENT LOCATION AND SERVICING (Cont.)

OIL SERVICING**EQUIPMENT AND MATERIALS**

- Cleaning Solvent.
- Lubricating Oil - MIL-L-23699, Mobil Jet Oil II (Mobil II).
- Main Landing Gear Door Downlock.
- Container - 2 gallon capacity.

DRAIN AND REFILL OIL TANK

- 1) If necessary, start and operate APU until oil reaches steady temperature to ensure hot oil drain. Refer to 49-00 (B-727 Maintenance Manual) Auxiliary Power Unit - Maintenance Practices page 5-3-1.
- 2) Open control circuit breaker, located in APU section of circuit breaker panel P6.
- 3) Open main landing gear doors and install downlocks.
- 4) Loosen oil tank filler cap to vent tank and aid draining.
- 5) Place container under oil tank drain port. Remove drain plug at bottom of oil tank, while oil is still hot, and allow oil to drain.

WARNING: PROLONGED CONTACT OF OIL WITH THE SKIN MAY CAUSE DERMATITIS AND SHOULD BE AVOIDED. THE OIL WILL STAIN CLOTHING AND CAN SOFTEN PAINT. REMOVE SATURATED CLOTHING IMMEDIATELY AND WASH SKIN THOROUGHLY AFTER CONTACT. CLEAN SPILLED OIL OFF PAINTED SURFACE IMMEDIATELY.

- 6) Check drained oil for abnormal metal particles which may indicate internal damage to engine. If indicated, return engine to overhaul facility for corrective action.
- 7) Remove screen from oil tank filler, wash in solvent, and dry with clean compressed air.

WARNING: SOLVENT IS HIGHLY TOXIC; USE IN WELL VENTILATED AREA.

- 8) Check gasket in oil tank filler for damage or deterioration, replace if necessary.
- 9) Install new oil filter element.
- 10) Install drain plug, with new packing, and lockwire.
- 11) Install screen in oil tank filler.
- 12) Fill oil tank with approved oil. Allow time for oil level to recede as air is vented, then add oil to bring level to FULL mark on dipstick.

CAUTION: ANY SUBSTITUTION OR USE OF NONAPPROVED LUBRICANTS, OR MIXING OF BRANDS OF LUBRICANTS MAY CAUSE ENGINE DAMAGE.

NOTE: Capacity of oil tank is 1 U. S. Gallon.

COMPONENT LOCATION AND SERVICING (Cont.)

- 13) Replace filler cap; line on cap must be in line with marks on filler neck.
- 14) Motor engine for 30 seconds, as necessary, to prime oil pump. Refer to page 5-3-4 Motoring Procedures.
- 15) Start and operate engine for 3 to 5 minutes. Refer to page 5-3-1 APU Start Procedures.
- 16) Stop engine. Add oil as necessary to bring level back to FULL mark on dipstick.

WARNING: STOP ENGINE PRIOR TO FILLER CAP REMOVAL TO AVOID POSSIBLE HOT OIL EJECTION.

- 17) Remove downlocks from main gear doors and close doors.

TOPPING-OFF APU OIL TANK LEVEL

- 1) Open wheel well (100 series A/C left wheel well, 200 series A/C right wheel well), open APU oil tank filler cap and check oil level on dipstick.

NOTE: If dipstick check indicates that oil should be added, the APU could have windmilled in flight causing oil to collect in the APU accessory gearbox. Operating APU 2 minutes prior to top-off balances the lube scavenge system and establishes proper oil tank level.

- 2) Add oil, as necessary, to FULL mark on dipstick.
- 3) Install dipstick and filler cap. Line on filler cap must be in line with marks on filler neck.

QUICK REFERENCE DATA**EMM CHAPTER****PAGE****APU SERVICING**

DRAIN & REFILL OIL TANK

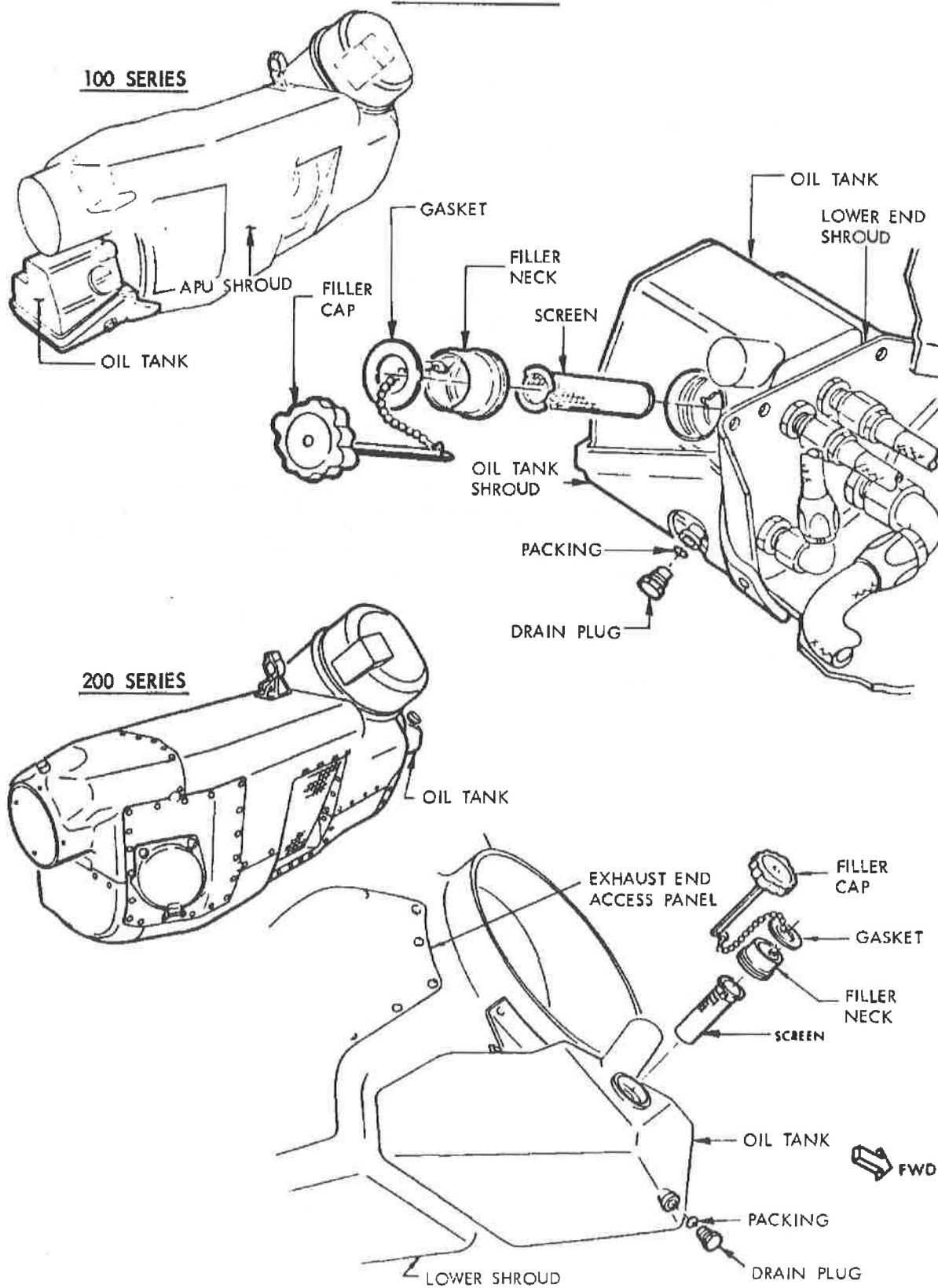
8-21-1

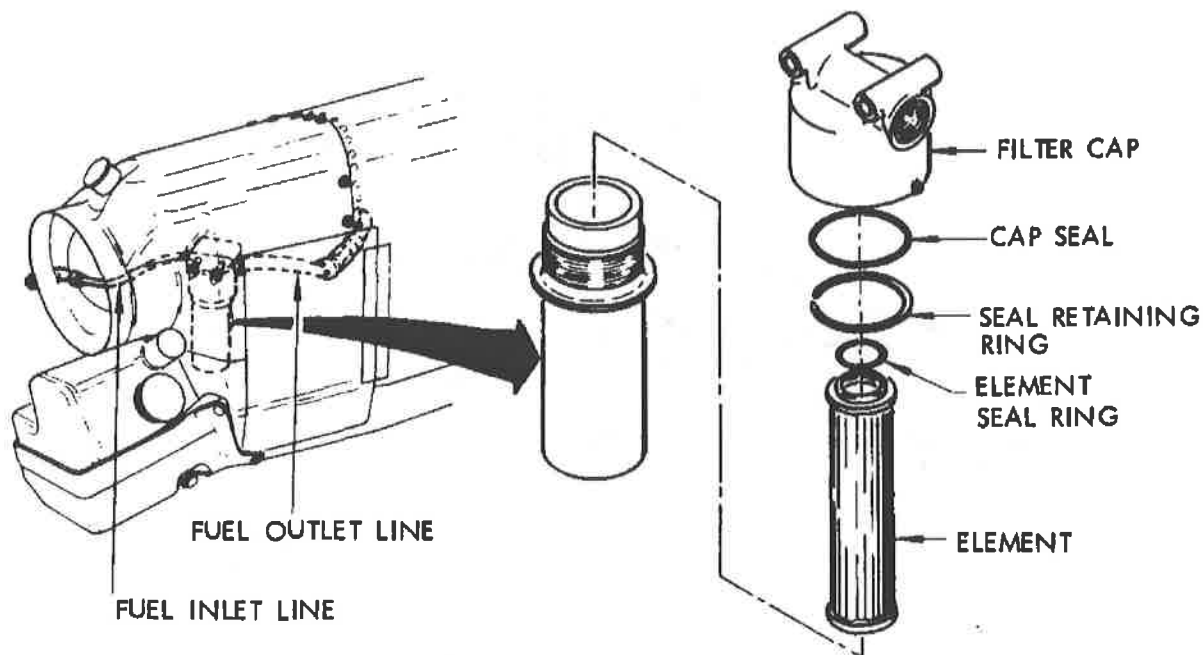
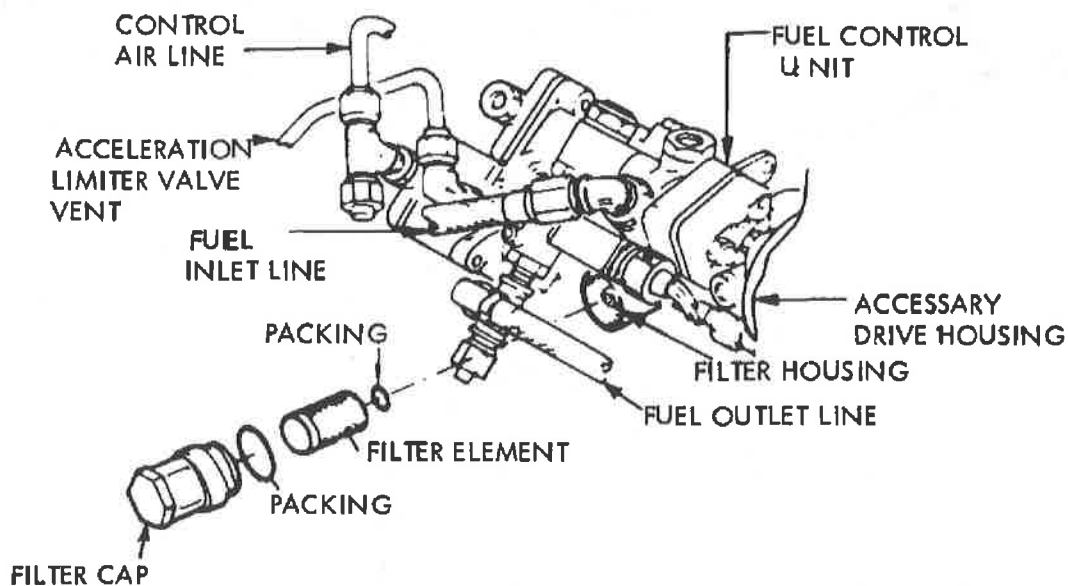
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TOPPING-OFF APU OIL TANK LEVEL

8-21-1

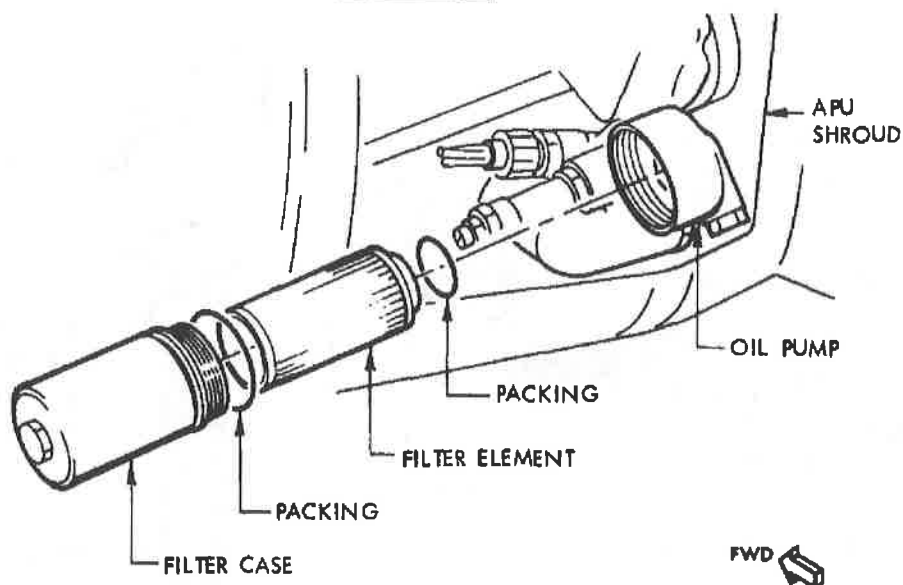
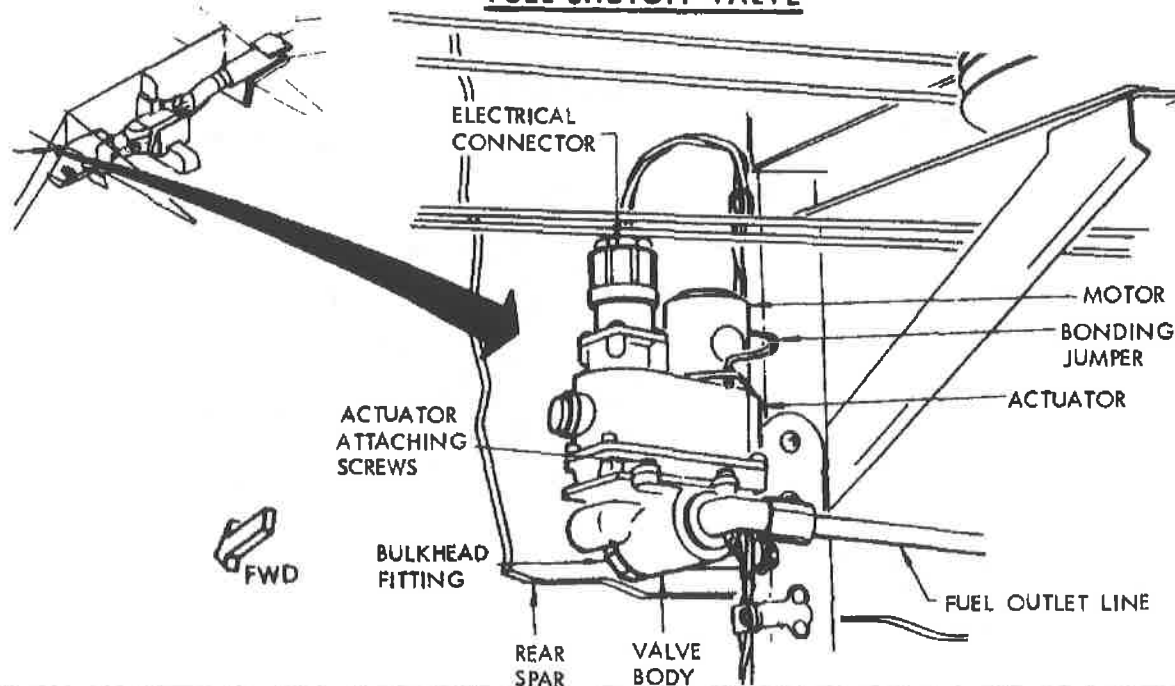
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COMPONENT LOCATION AND SERVICING (Cont.)APU OIL TANK

COMPONENT LOCATION AND SERVICING (Cont.)LOW PRESSURE FILTERHIGH PRESSURE FILTERQUICK REFERENCE DATA

LOW PRESSURE FUEL FILTER - SERVICING
HIGH PRESSURE FUEL FILTER - SERVICING

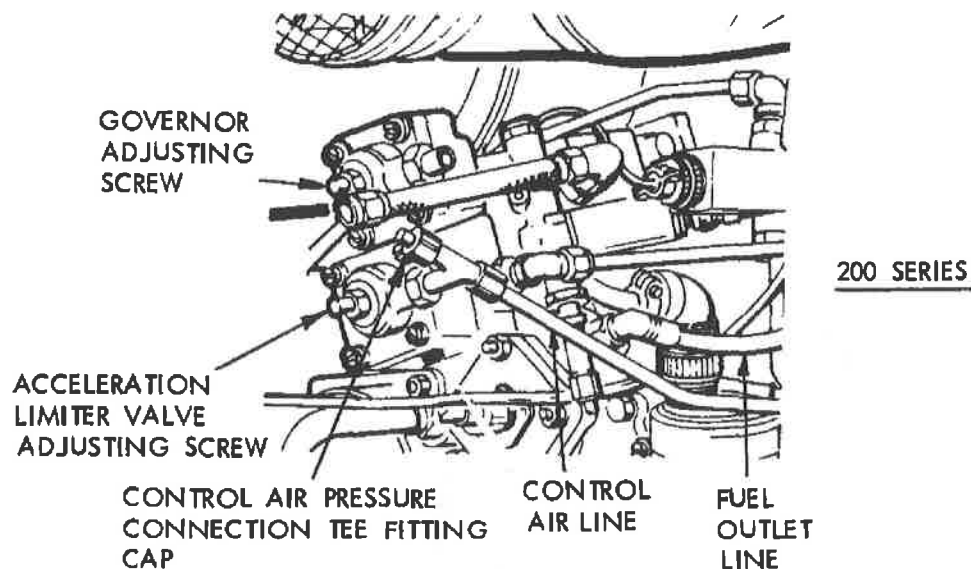
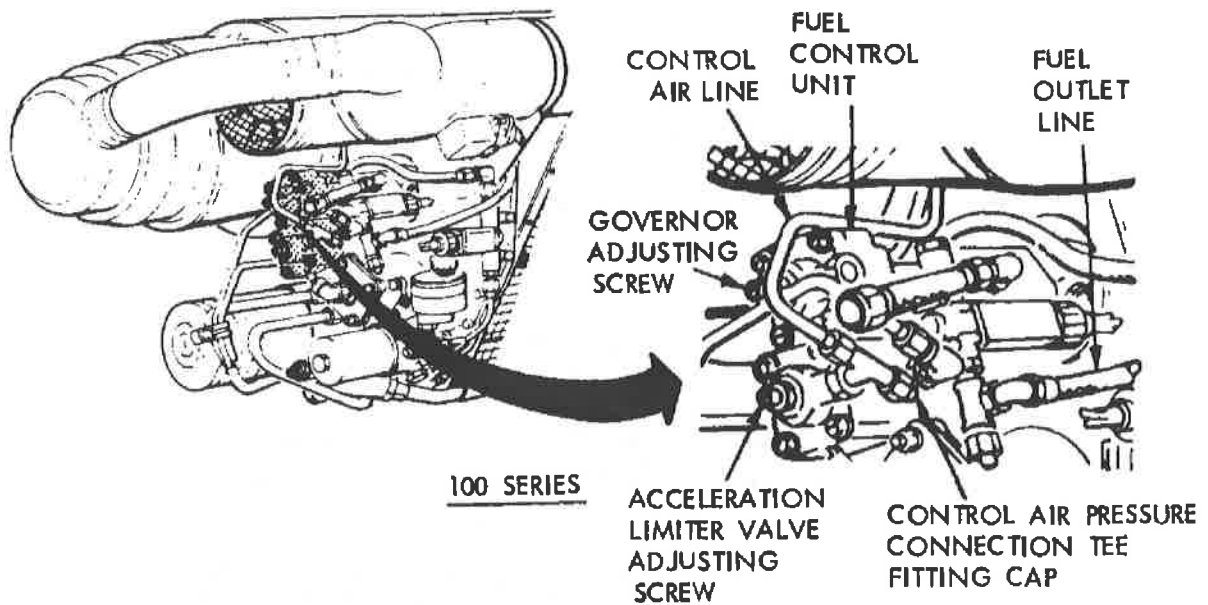
M.M. CHAPTER	PAGE
49-30-61	301
49-30-71	301

COMPONENT LOCATION AND SERVICING (Cont.)OIL FILTERFUEL SHUTOFF VALVE

QUICK REFERENCE DATA

OIL FILTER SERVICING
APU FUEL SHUTOFF VALVE R/I
AIRCRAFT 101 thru 118
ALL OTHERS

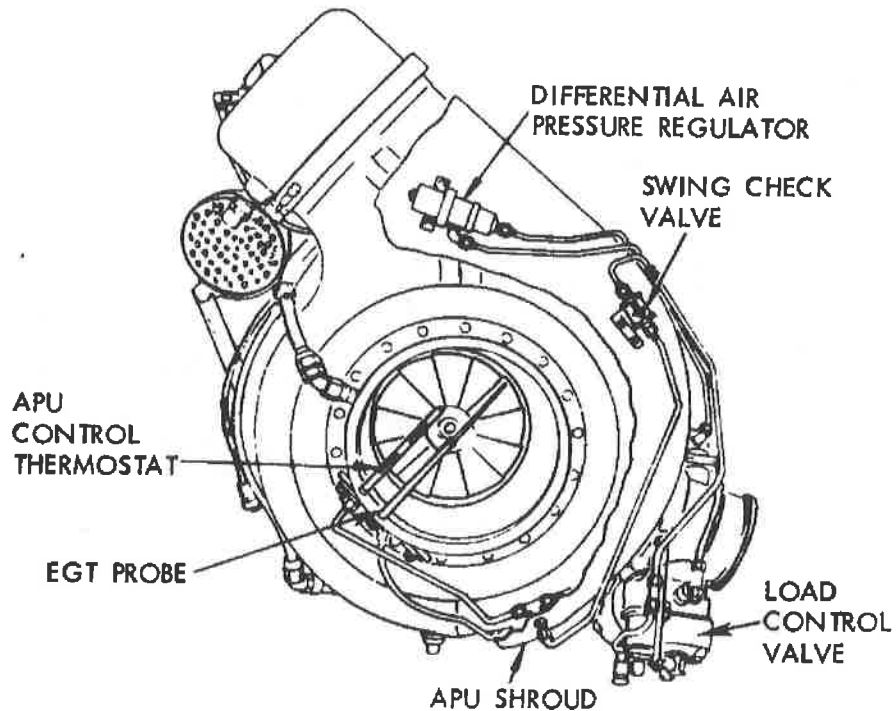
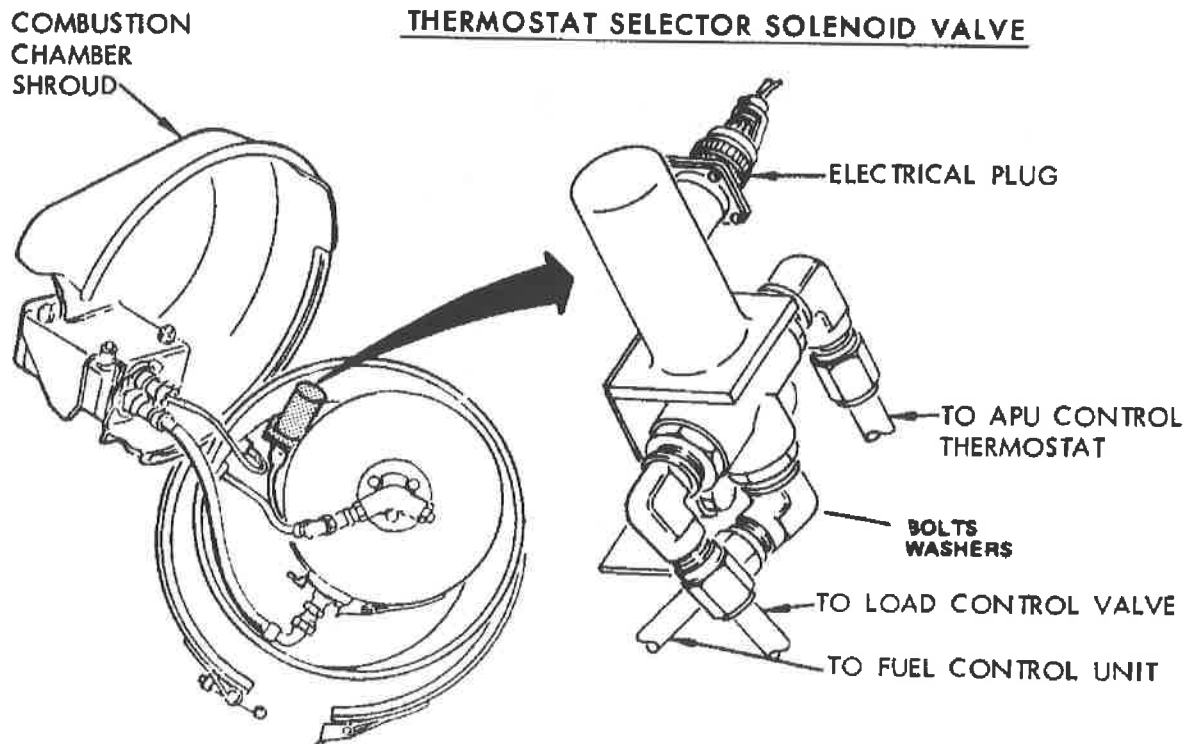
M.M. CHAPTER	PAGE
49-90-11	301
49-30-41	401
49-30-42	401

COMPONENT LOCATION AND SERVICING (Cont.)FUEL CONTROL UNITQUICK REFERENCE DATAM.M. CHAPTER PAGE

ACCELERATION LIMITER VALVE CRACKING
PRESSURE ADJUSTMENT & TEST

49-00

501

COMPONENT LOCATION & SERVICING (Cont.)CONTROL THERMOSTAT & EGT PROBETHERMOSTAT SELECTOR SOLENOID VALVE

(SHOWN WITH COMBUSTION CHAMBER SHROUD REMOVED)

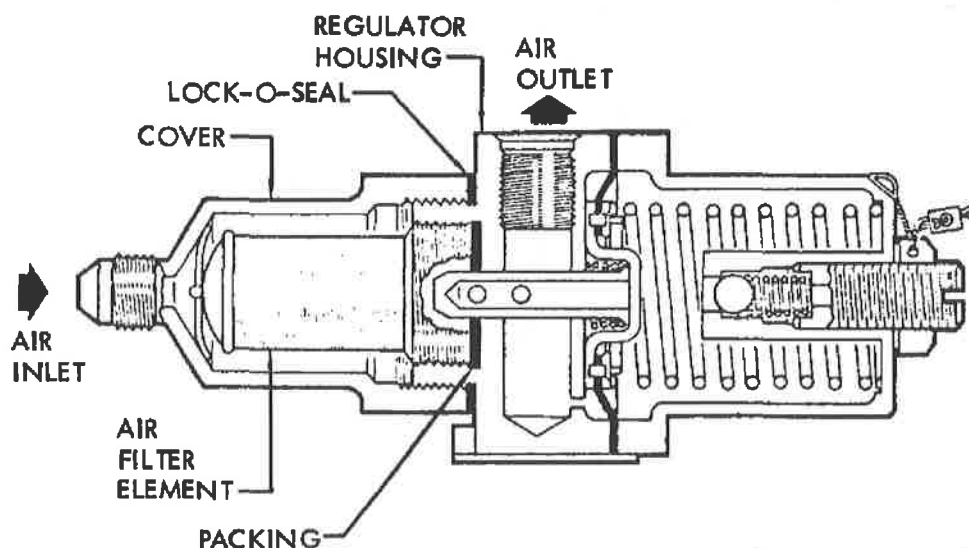
COMPONENT LOCATION & SERVICING (Cont.)

DIFFERENTIAL AIR PRESSURE REGULATOR FILTER SERVICE

- 1) Remove regulator air inlet line clamp and inlet line from regulator.
- 2) Remove cover from regulator housing and remove filter.
- 3) Remove lock-o-seal (including retaining washer) and packing from regulator housing.
- 4) Clean filter element using Turco Transpo. Wash filter in MEK and dry with clean compressed air.
- 5) Coat external threads of air pressure regulator housing with grease.
- 6) Install new lock-o-seal (including retaining washer) and new packing(s) in regulator housing.

CAUTION: ENSURE THAT THE CORRECT CONFIGURATION OF PACKING(S) IS USED OR DAMAGE TO FILTER ELEMENT COULD RESULT. DIFFERENTIAL AIR PRESSURE REGULATOR P/N 108032-3, USES TWO PACKINGS; P/N 108032-8, USES ONE PACKING.

- 7) Position filter in cover; install cover on regulator housing.
- 8) Test Differential Air Pressure Regulator (Ref. 49-00, Adjustment/Test; Bleed Air (Load Control) Valve Operation Test (NO LOAD)).



QUICK REFERENCE DATA

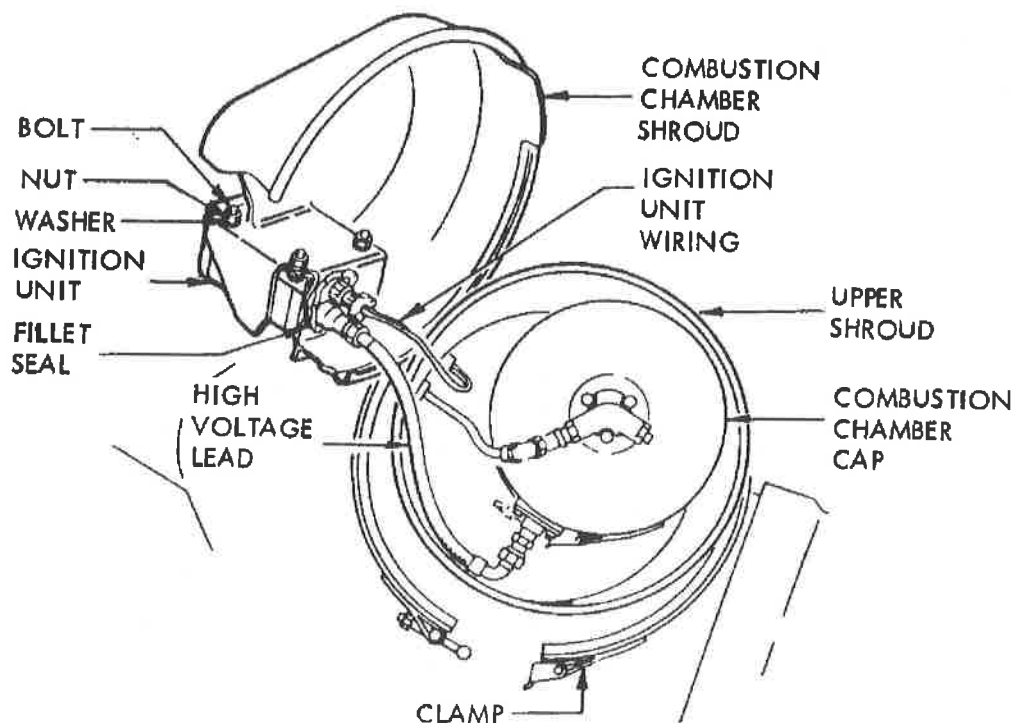
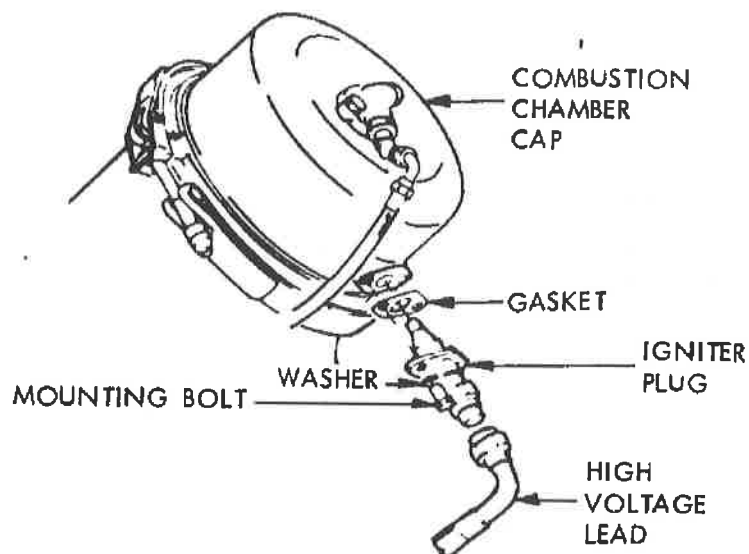
M.M. CHAPTER PAGE

DIFFERENTIAL AIR PRESSURE REGULATOR
FILTER SERVICING

49-52-43

301

COMPONENT LOCATION AND SERVICING (Cont.)

IGNITION UNIT & IGNITER PLUG

QUICK REFERENCE DATA

IGNITION UNIT R/I

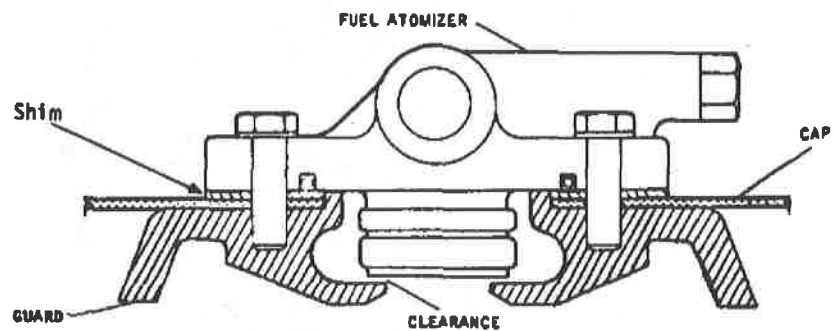
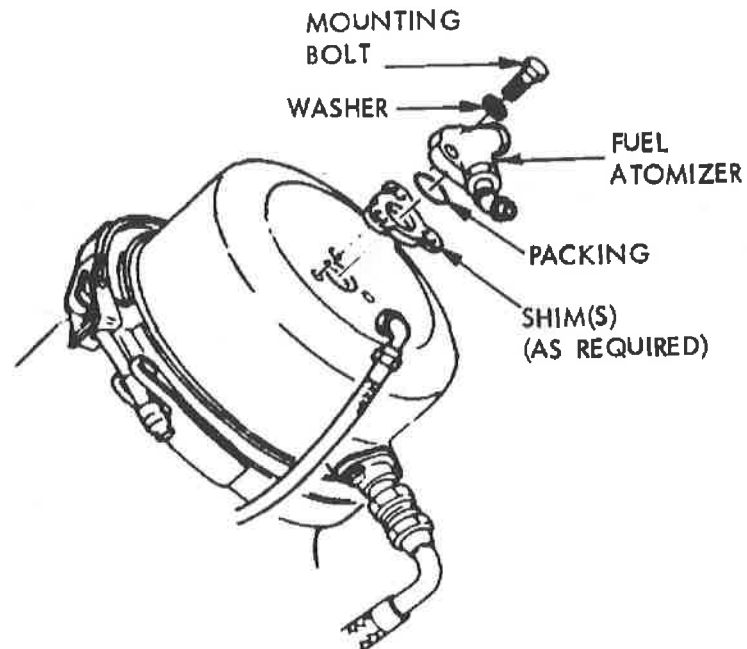
IGNITER PLUG R/I

M.M. CHAPTER

49-40-11

49-40-21

COMPONENT LOCATION AND SERVICING (Cont.)

FUEL ATOMIZER

QUICK REFERENCE DATA

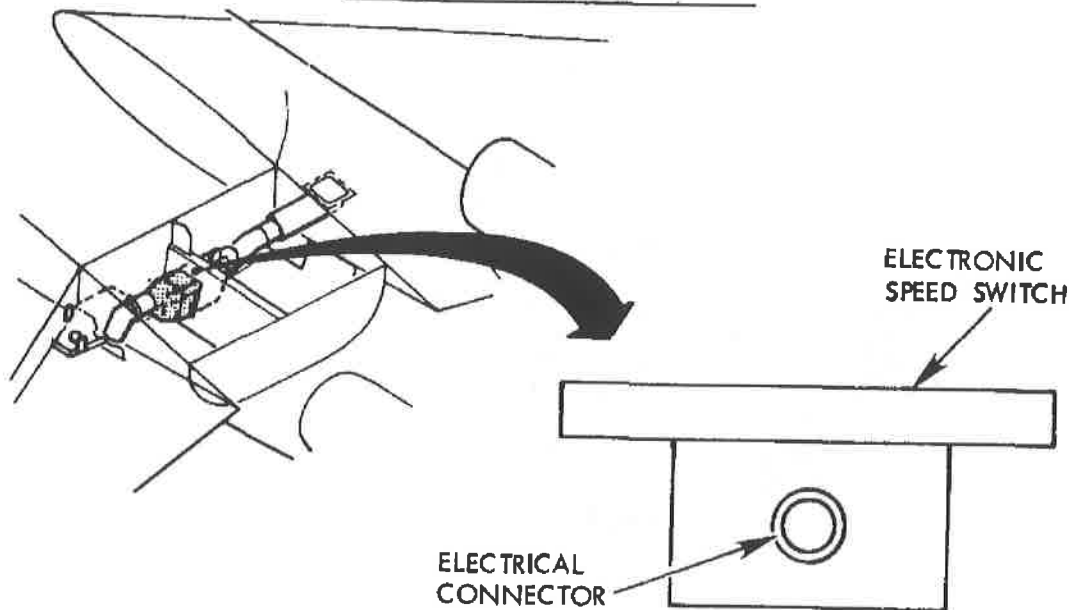
FUEL ATOMIZER R/I
FUEL ATOMIZER SHIM ADJUSTMENT

M.M. CHAPTER

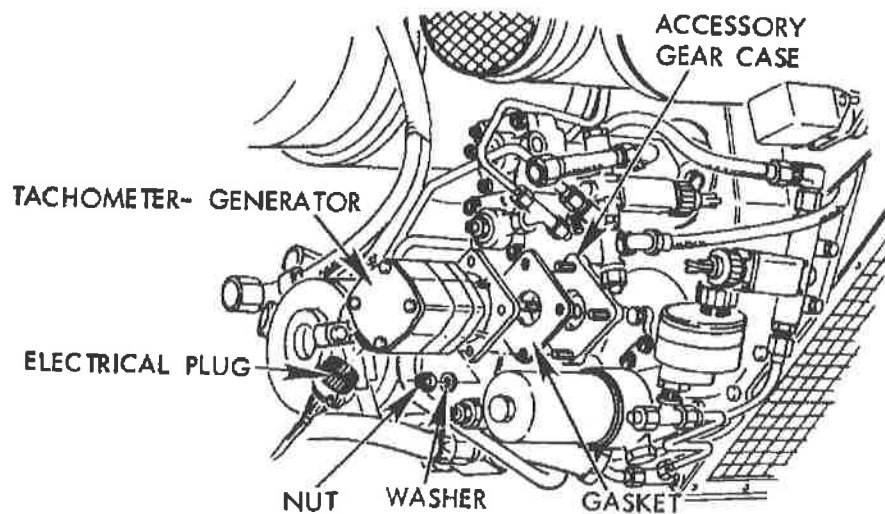
49-30-21
49-30-21

COMPONENT LOCATION AND SERVICING (Cont.)

ELECTRONIC SPEED SWITCH



TACH GENERATOR

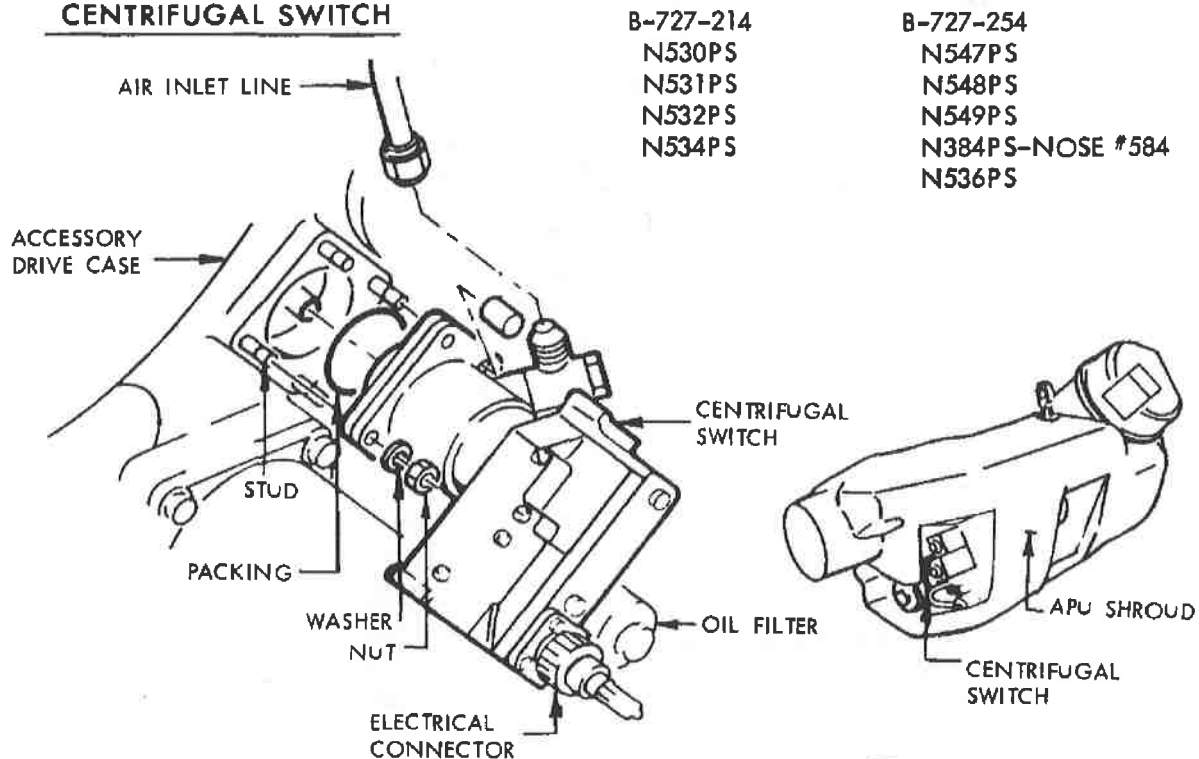


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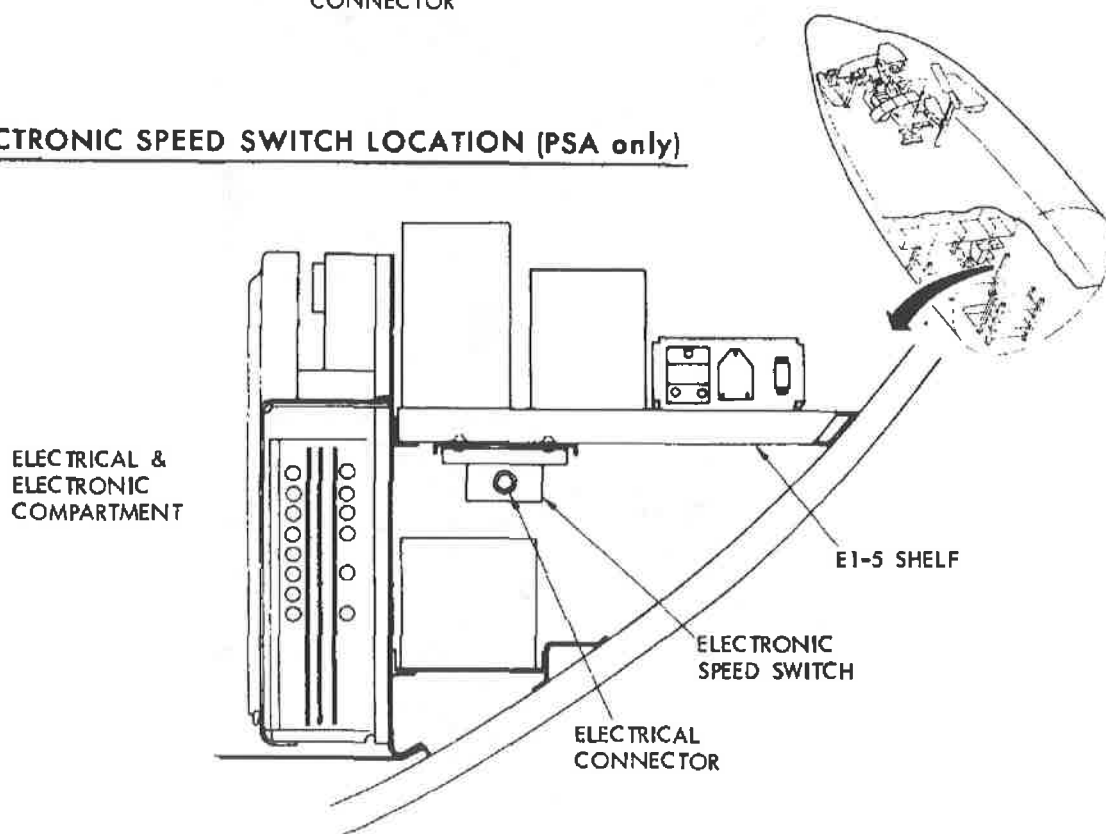
COMPONENT LOCATION AND SERVICING (Cont.)

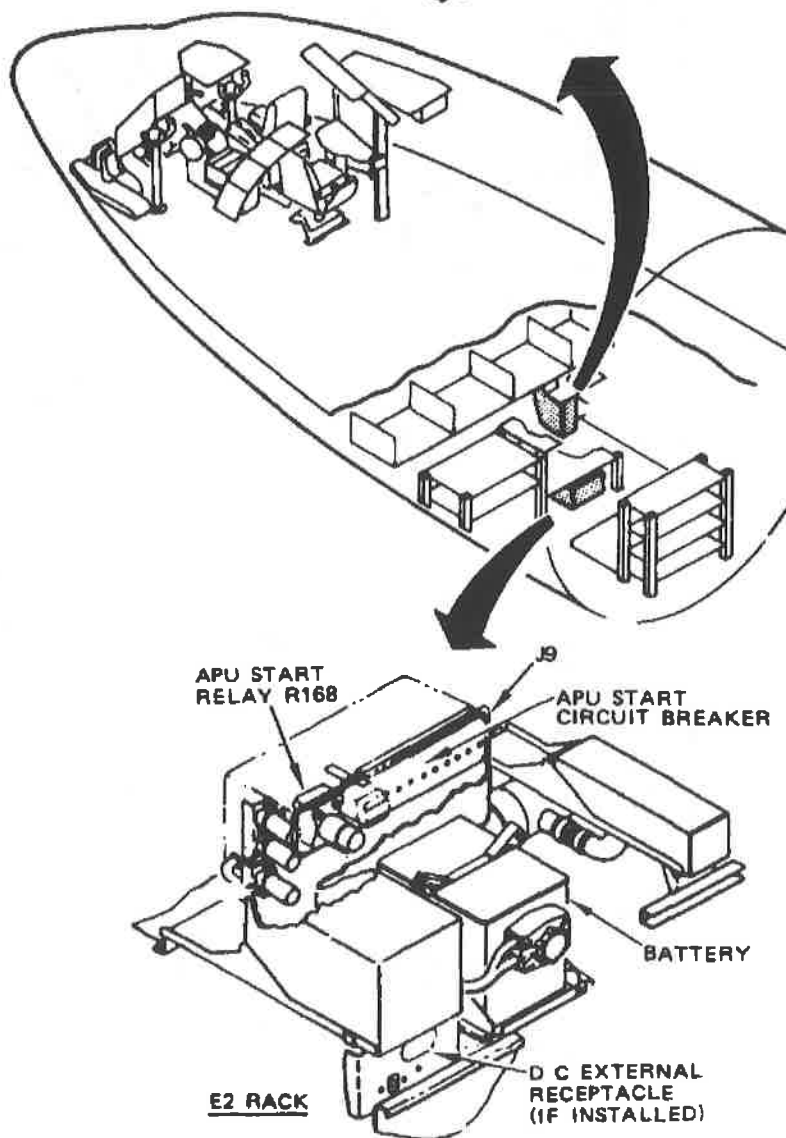
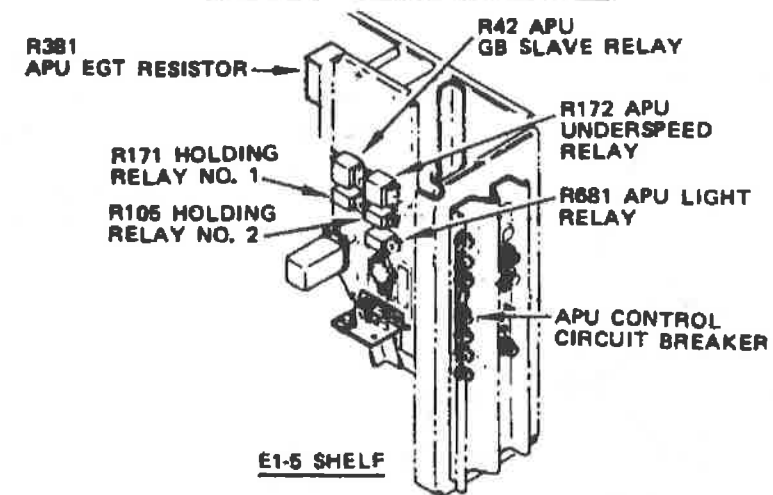
PSA AIRCRAFT MODELS -214 & 254

CENTRIFUGAL SWITCH



ELECTRONIC SPEED SWITCH LOCATION (PSA only)



COMPONENT LOCATION & SERVICING (Cont.)ELECTRICAL COMPONENTS

TROUBLESHOOTING AND TEST PROCEDURES**AUXILIARY POWER UNIT - TROUBLE SHOOTING**

Chapter 49-00, Page Block 101-200, provides trouble shooting charts and tips, indication and/or symptoms for detecting and isolating APU malfunctions. To find and correct auxiliary power unit troubles, first study the symptoms carefully, then check each possible cause, beginning with the most probable, until the exact cause of the trouble is determined. The charts list troubles in the sequence most likely to occur before starting, during starting, after starting and during shutdown. The charts do not list all possible short circuits, wire breaks or loose connections as normal maintenance and inspection procedures which should eliminate most of these troubles. In the event of an electrical failure, Chapter 49 of the Wiring Diagram Manual should be consulted.

WARNING: THE CURRENT INVOLVED IN THE IGNITION UNIT IS OF A VERY HIGH VOLTAGE AND CAN BE FATAL. WHEN TROUBLE SHOOTING THE IGNITION SYSTEM, BE SURE THAT POWER IS REMOVED FROM THE SYSTEM FOR A MINIMUM OF 4 MINUTES BEFORE MAKING ANY DISCONNECTIONS. AFTER DISCONNECTING THE HIGH TENSION LEAD, ENSURE COMPLETE DISCHARGE OF CAPACITORS BY IMMEDIATELY SHORTING IGNITION UNIT TERMINAL TO GROUND. DO NOT OPERATE THE IGNITION SYSTEM UNLESS THE IGNITION PLUG IS PROPERLY GROUNDED.

CAUTION: TO AVOID DAMAGING APU, OBSERVE OPERATING LIMITS (REF MAINTENANCE PRACTICES, OPERATE APU).

NEVER EXCEED STARTED DUTY CYCLE IN THE PROCESS OF ATTEMPTING TO DETECT APU PROBLEMS. HIGH ENERGY STARTERS ARE EASILY OVERHEATED AND CONSEQUENTLY DAMAGED.

DO NOT OPERATE APU UNLESS FUEL IS PRESENT AT THE FUEL CONTROL UNIT. DAMAGE FROM LACK OF LUBRICATION WILL OCCUR.

DO NOT OPERATE APU UNLESS OIL IS AT ITS PROPER LEVEL; DAMAGE FROM LACK OF LUBRICATION WILL OCCUR.

NOTE: When it is necessary to secure an inoperative APU for aircraft flight, refer to Secure Inoperative APU in Auxiliary Power Unit - Maintenance Practices.

When the APU shuts down for no apparent reason and will not restart normally it should be inspected for evidence of an overheat prior to reset of the fire warning.

Inspect APU for evidence of an overheat through the shroud access panel in the right wheel well at the exhaust end of the APU.

- If evidence of an overheat is found notify Technical Control and dispatch the aircraft with APU inoperative.
- If no evidence of an overheat is found, reset the fire warning and restart the APU.

APU trouble shooting is electrically oriented, and is divided into four parts; malfunctions before start, malfunctions during start, malfunctions after start, and malfunctions related to APU shutdown. Each malfunction identifies a procedure.

TROUBLESHOOTING AND TEST PROCEDURES (Cont.)

EQUIPMENT AND MATERIALS

- Multimeter
- Pressure gage - 0 to 200 PSIG
- Pressure gage - 0 to 100 PSIG
- RPM Indicator and Tachometer - Generator Test Set - F72891-1

TROUBLE SHOOTING TIPS

Many external signs of trouble may be evident during APU operation. An observer can be used in trouble shooting to aid the APU operator. Some conditions to watch for are:

- Smoke in the ventilation system.
- Strange noises in the APU compartment.
- Fire or smoke in the exhaust ducting.
- No air pressure in APU drain system while APU is operating.
- Fluids draining from APU drain system.

QUICK REFERENCE DATA
